COMPACT APPARATUS FOR COVERING LANDFILL

CROSS REFERENCE TO RELATED APPLICATIONS

[001] The present application is a continuation in part of U.S. Patent Application 09/566,718 entitled "Compact Apparatus for Covering Landfill" filed on May 09, 2000.

BACKGROUND OF THE INVENTION

Field of the Invention

[002] The present invention is directed to a method and apparatus for laying a cover on a landfill, and more particularly to a method and apparatus for laying a cover on the landfill, and depositing ballast on the cover.

Description of the Related Art

[003] Landfills have become highly regulated in recent years with an emphasis on minimizing their impact to surrounding populations and the environment. Regulatory agencies, like the Environmental Protection Agency of the United States, mandate requirements for landfill design and maintenance in an attempt to minimize the potential for odors, ground water contamination, fires, blowing litter, disease vectors, and vermin infestation. In an attempt to prevent such undesirable occurrences, regulatory agencies have adopted strict restrictions and codes as to the construction and covering of landfills.

[004] Often, new landfills are created with a liner constructed of a polymeric film to cover the bottom of the landfill to prevent ground water contamination and disease vectors. The liner is used to prevent seepage from the waste stored on top of the liner from entering into the community water table located underground. Most often, the liner is installed by overlapping sections of film laid along the bottom of the recently excavated landfill and heat sealing the sections together to

ensure that no liquid seeps through the liner between the panels of film and into the virgin ground underneath the landfill. It is preferred that such a liner have a long life expectancy and not degrade so that the water table may be separated from the landfill for as long as possible. Once the liner and a required minimum soil cover has been deposited over the base of the landfill, waste materials can then be accepted onto the landfill for disposal.

[005] Landfill covers are required by regulatory agencies at the end of every workday and for landfill sections that are to be left inactive for extended periods of time. Regulatory agencies require exposed waste to be covered in order to reduce the effects of fires, odor, vermin, litter, and disease on nearby populations. It is understood that the open face of a landfill is the surface of compacted trash and garbage, a portion of which is enclosed in plastic bags, and other waste, but can also contain tree pieces, cans, small appliances, wood, shingles, building materials of all kinds, dirt, sludge, or any other material permitted in a landfill. Traditionally, soil was used as the primary means of cover and was applied upon deposited waste in amounts governed by how long the section of the landfill is to remain inactive.

[006] Many current regulations require daily coverage of exposed waste with the daily cover including a minimum of six (eight in some locations) inches of soil applied to the landfill workface. Due to the non-homogeneous layout of most landfills, such a layer of soil may actually reach from 12 to 15 inches in height in certain areas in order to ensure that the six inch minimum exists throughout. Careful planning and management must be applied to each landfill installation to ensure that the utility of the available airspace is maximized. For this reason, landfills are preferably filled in sections, rather than all at once. The accepted process for waste material disposal is to section off a portion of the landfill for the day's fill and to deposit material there, compact throughout the day, and then cover the section at day's end.

[007] To maximize the effective use of landfill space, the waste is compacted. Compaction is usually performed in two stages, prior to and after waste deposit in the landfill. Compaction prior to delivery at the landfill is usually performed either by the trash collection trucks or at separate compaction or bailing facilities. Generally, household waste, as collected, is between 250 and 300 lb/yd^3 in density. Collection trucks are able to further compact this waste to 400-700 lb/yd^3 and bailing facilities are capable of compacting waste to levels exceeding 1000 lb/yd^3 in density. Once brought to the landfill facility, waste is deposited into a section of landfill and is further compacted by driving compaction equipment over and about the exposed waste.

[008] Examples of the compaction equipment used for this purpose ranges from dedicated compactors, to standard earthmovers and bulldozers. The size, weight, and range of compaction equipment generally corresponds to the size of the landfill installation, with the largest landfills having the most diverse and heaviest equipment. The compaction equipment is used to move and compact waste material within the deposit zone with its attached blade or bucket device. Once the initial placement and compaction is performed, the compaction equipment is then driven over the deposited waste material several times throughout the workday, further compacting the deposited fill waste. The fill is compacted, preferably using an area, trench or ramp method, into an open face which is typically inclined at angle of from 5° to 20°.

[009] Studies have shown that 3 to 4 compaction cycles provide the ideal amount of compaction for any given weight of machine and that increasing the number of compaction cycles beyond 4 typically yields little gain in effective compaction. Once placed and compacted within the landfill, the same ordinary household waste that began at 250-300 lb/yd^3 is now stored within the landfill at 600-1500 lb/yd^3, with the actual amount of compaction depending on the weight and size of the equipment utilized and the number of compactions.

[0010] Because waste storage capacity is a landfill's most precious commodity, the traditional soil method of covering the waste has become less and less popular in recent years. In response to the recent demands for more efficient usage of landfill space, alternative daily cover, or ADC, systems have been suggested. The primary goal of an ADC is to perform all the functions of an eight to six inch layer of soil without the drawback of consuming large amounts of landfill capacity. Attempts have been made to cover landfills with removable tarps, but it has been shown that the deployment and retrieval processes are difficult and labor intensive. Nondegradable disposable plastic liners that are designed to be left in place have been proven to take up little landfill space but are considered potentially dangerous because of their tendency to trap methane and other gasses generated by the waste within the layers of the fill.

[0011] One ADC that has been widely accepted is the use of a degradable polyolefin film as disclosed in U.S. Patents 5,416,133 and 5,565,503, both hereby incorporated herein by reference. The degradable film of polyolefin is desirable as an ADC because it conserves valuable fill capacity and degrades quickly enough (either through chemical, photo, stress, thermal, or biodegradation) to reduce the potential for the buildup of gasses between fill layers. Apparatuses and methods for deploying degradable film is disclosed in U.S. Patents 5,536,116 (the "116 patent") and 5,620,281 and U.S. Patent Application Serial No. 09/510,956, filed February 22, 2000 all hereby incorporated herein by reference.

[0012] The apparatus disclosed in the '116 patent includes a film deployment apparatus that may be disposed on the blade of a tractor or other prime mover. The deployment apparatus is attached to the blade, usually by chains, hooks, or both. The tractor is usually powered by a diesel engine while the blade, which may be lifted and lowered, is operated by hydraulic fluid lines and a conventional electrical system. The required hydraulic and electrical power needed to operate the

deployment apparatus may be obtained from the tractor by conventional hydraulic and electrical take-off lines. Alternatively, the power, fuel and hydraulic systems may be self contained on the deployment apparatus. After the deployment apparatus is attached to the blade, it may be lifted off the ground by actuating a hydraulic cylinder. When not used to support the deployment apparatus, the blade is used to push the waste fill into the operating area of the landfill.

[0013] The deployment apparatus operates by unrolling a panel or width of film from a roll of film rotatably mounted on the deployment apparatus as the tractor moves over the workface of the landfill. Frequently, below the roll of film is at least one roller which draws the film back and down as it is unrolled from the film roll. The roller draws the film as close to the workface of the landfill as quickly as possible, thus allowing the film to unroll over the exposed workface of the landfill and seal off deposited waste from the elements and scavenging animals. Once a layer of film is deposited, the film is cut, either by hand or automated device, and the tractor is returned to the top of the workface to lay another layer of film adjacent to the first layer with several inches of overlap. This process is repeated until the entire day's fill is covered.

[0014] Because the film that is laid upon the landfill would otherwise be susceptible to being blown away, the deployment apparatus also deposits ballast on the film as it is laid. The ballast can take the form of any solid or semi-solid medium but is preferably soil. The deployment apparatus contains hoppers that are preferably large enough to hold enough ballast to complete the daily cover operation without refilling. Mechanical apparatus direct the ballast out of the hoppers through outlets, where the ballast is deposited onto the desired locations of laid film.

[0015] Each layer of film generally is deployed by positioning the tractor at the top of the area to be covered so that the film is deployed as the tractor backs down the face of the landfill. The film is extended outward of the deployment apparatus and positioned under the guide roller. At the

start of each pass of film, the ballast distribution mechanism is activated to deposit ballast upon the leading edge of film. The weight of the deposits of ballast is sufficient to hold the leading edge of the film in place while the tractor with attached deployment apparatus is backed down the workface of the landfill. At intervals selected by the operator, which are either accumulated manually or automatically, additional deposits of ballast are made to help secure the film in place atop the workface of the landfill. Additionally, when beginning a pass over the workface, the film can be temporarily attached about the roller in such a fashion that the weight of the first deposit of ballast frees the film from the roller and allows deployment without assistance.

[0016] With the film secured in place atop the workface by the ballast, the requirements for an ADC are met using a system that consumes much less landfill space than the traditional soil cover method. Traditional soil cover systems cost landfill operators a large amount of resources in terms of equipment required and effective fill capacity. A traditional soil cover system requires a large amount of soil to be located nearby and more machinery to emplace than a degradable film cover system.

[0017] The apparatus of the '116 patent is designed for large amounts fill space which must be covered with high frequency. For small landfills, such as those for remote municipalities, a smaller, less expensive apparatus to deploy film and ballast is highly desirable. Because of the lesser amount of waste deposited each day, small-scale fills are typically in a position to benefit even more from ADC systems than their larger counterparts. For such small-scale facilities, the soil cover material represents a higher percentage of the fill capacity than at larger facilities.

[0018] The present invention overcomes the deficiencies of the prior art.

BRIEF SUMMARY OF THE INVENTION

[0019] The apparatus and method of the present invention enables a landfill operator to deploy a film material from a standard bucket loader to the working surface of a landfill. The apparatus is preferably attached to the bucket assembly of loader and deploys film as the loader is driven over the working surface of the landfill. Periodically, at intervals determined by the operator, the bucket, which contains a ballast material, is manipulated to allow ballast material to drop onto the film and hold the deployed film in place. In a preferred embodiment, the apparatus includes a roll of film mounted on a mandrel between two flanges. Such an apparatus is preferably attached to the bucket device through chains or wire rope in such a manner as to allow full operation of the bucket while the apparatus is attached. The apparatus of the present invention is also capable of spraying a pesticide, deodorant, or any other chemical, to the exposed working surface. If more than one panel is required to cover the work area, it is preferred that adjacent panels, with some overlap, be laid.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] For a detailed description of a preferred embodiment of the invention, reference will now be made to the accompanying drawings wherein:

[0021] Figure 1 is a side view of a wheel loader and film deployer in accordance with the present invention;

[0022] Figure 2 is an exploded view drawing of the film deployer of Figure 1;

[0023] Figure 3 is an isometric detail of the fixed flange and mandrel of Figure 1;

[0024] Figure 4 is an isometric view of the detachable flange of Figure 2;

[0025] Figure 4 is an end view of the attachment guard of Figure 2;

[0026] Figure 5 is a perspective view of a protective shield;

[0027] Figure 6 is a drawing of the wheel loader and film deployer of Figure 1 before film is deployed; and

[0028] Figure 7 is a drawing of the wheel loader and film deployer of Figure 1 during film deployment; and

[0029] Figure 8 is the wheel loader and film deployer of Figure 1 further including a spraying apparatus.

[0030] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that the drawings and detailed description thereto are not intended to limit the invention to the particular form disclosed, but on the contrary, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the present invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] Referring initially to Figure 1, a film deployment apparatus 10 in accordance with a preferred embodiment is shown. Deployment apparatus 10 is preferably attached to the front end

12 of a loader 14 such as to a container or bucket by any pair of suitable members such as chains 16. The chains 16 support a roll of film 18. As is well known in the art, the bucket 12 may be raised, lowered and tilted hydraulically by controls. Deployment apparatus 10 lays a panel of film 18 over a work surface 20, as hereinafter described, as loader 14 is driven thereover.

[0032] Referring now to Figures 1 and 2, apparatus 10 preferably includes a mandrel 26 having a flange 22 fixed at one end and a flange 24 detachably connected to the opposite end of mandrel 26. Mounted upon each flange 22, 24 is a connection member such as an eyelet 28 by which deployment apparatus 10 preferably attaches bucket 12 by attaching chains 16 between eyelets 28 and hooks 34 mounted upon sides of bucket 12. The chains 16 suspend apparatus 10 below the bucket 12 taking advantage of the gravitational pull; as the bucket 12 is tilted. Although chains 16 are shown in the preferred embodiment, it can be understood that any other means of attachment can be utilized including but not limited to rope, wire, cables, or rigid structural members. Also, while attachment chains 16 are shown in Figure 2 to be equal in length causing mandrel 26 to be suspended at equal lengths from deployment apparatus 10 resulting in a substantially horizontal mandrel 26, it should be understood that the relative lengths of chains 16 may be adjusted to allow mandrel 26 to be suspended at differing lengths from deployment apparatus 10 causing mandrel 26 to be at an angle with respect to work surface 20 or bucket 12.

[0033] It is also preferred that flanges 22 and 24 be strong enough to resist bending if chains 16 extend inward or outward. Depending on the size of the bucket 12 and width of roll 32 of film, chains 16 may have to angle inward or outward to connect the two together. To strengthen flanges 22 and 24, they may be manufactured of a thicker material, or structural braces may be attached.

[0034] In the preferred embodiment, film roll 32 includes a length of film 18 that has been circumferentially rolled up around a tubular axle (not shown) having a bore therethrough for

receiving mandrel 26. Mandrel 26 is installed by first removing detachable flange 24 and then sliding the free end 33 of mandrel 26 through the bore or film roll 32 until the end of the roll engages flange 22. Mandrel 26 acts as a spindle and preferably combines with flanges 22 and 24 to form a spool. To facilitate ease of lifting, mandrel 26 is preferably constructed in a generally tubular fashion. Film roll 32 is preferably constructed such that its inner diameter is slightly larger than outer diameter of mandrel 26 to allow film 18 to "roll" off as it is pulled from roll 32. Alternatively, bearings may be installed between roll 32 and mandrel 26 to facilitate ease of deployment. Alternatively still, bearings may be positioned between flanges 22, 24 and film roll 32 to allow film 18 to be deployed directly to work surface 20 without requiring mandrel 26. Such bearings, if used, may be of sleeve, journal, roller or ball bearing type.

[0035] Film 18 is preferably degradable through chemical, mechanical, thermal, photo, or biodegradation. Although deployer 10 preferably deploys a degradable film material, it can be used to deploy any material for covering the landfill and may be degradable or non-degradable. The material is preferably stored in rolled form. For example, non-degradable films may be deployed for more permanent or long term cover or lining applications. Alternatively, breathable textile materials may also be deployed on landfill surfaces as effective short or long-term cover. Examples of breathable textile materials for landfill cover are described in United Kingdom patent Application No. GB9407807.8 entitled "Waste Disposal," hereby incorporated herein by reference. Examples of film 18 which are degradable are described in U.S. Patents 5,416,133 and 5,565,503 incorporated by reference above.

[0036] Flanges 22 and 24 preferably include a sector cut 30 along their bottom edges to facilitate installation of film roll 32. Sector cuts 30 of flanges 22 and 24 enable mandrel 26 and flange 22 to be installed within roll 32 while flanges 22, 24 rest upon a surface without rolling. Otherwise,

depending on its outer diameter, film roll 32 may have to be lifted in order to receive mandrel 26 and attached flange 22 completely through the tubular axle. Once film roll 32 is mounted on mandrel 26, detachable flange 24 is re-attached and assembly 10 is ready to be attached to bucket 12 of loader 14.

[0037] Referring now to Figures 3 and 4, detachable flange 24 is preferably secured to mandrel 26 by a pin and J-slot arrangement. Mandrel 26 has one end attached to flange 22 and another end 33 free for attachment to flange 24. Free end 33 of mandrel 26 includes a J-slot 38 cut through its diameter and a tapered cone end 37. Detachable flange 24 of Figure 4 includes a short tubular extension 35 through which cone end 37 of mandrel 26 is engaged. Diametrically engaged through extension 35 of flange 24 is a pin 36 that corresponds to the width of J-slot 38. When cone end 37 is engaged within extension 35 of flange 24, pin 36 is concurrently engaged within J-slot 38 of mandrel 26. Once pin 36 is engaged within slot 38, detachable flange 24 is rotated until pin 36 securely retains flange 24 in place by J-slot 38. Alternatively, the pin and J-slot arrangement may be reversed such that tubular extension 35 includes the J-slot and mandrel 26 contains the pin. Alternatively still, the J-slot arrangement of Figures 3 and 4 may be replaced with a simple removable pin (not shown) that would engage flanges 22,24 and mandrel 26 therethrough concurrently. Additionally, both flanges 22, and 24 may optionally be detachable from mandrel 26.

[0038] Referring again to Figure 1, the location of hooks 34 on bucket 12 are at the discretion of the end user. It is preferred that the hooks 34 are positioned on bucket 12 such that an imaginary line drawn between them is substantially parallel to the surface of workface 20. It is also preferred that apparatus 10 be mounted upon bucket 12 of loader 14 in such a fashion that the axis of the roll 32 of film 18 be located behind the leading edge 39 of bucket 12 no matter what position bucket 12

may take. An example of an acceptable location is shown in Figure 1 wherein hooks 34 are attached above the pivot axis of bucket 12 when in the "up" position. By keeping the axis of roll 32 behind the leading edge 39 of bucket 12, it is ensured that ballast material may be effectively deposited to film 18 gravitationally.

[0039] Referring now to Figure 5, it is preferred that hooks 34 be fashioned from plates 40, 42 of steel welded together at joint 44. Plate 40 is to be welded in the desired location on bucket 12 such that joint 44 is pointed toward leading edge 39. Plate 42 includes an aperture 46 that includes a large profile 41 and a small profile 43. Aperture 46 is arranged such that small profile 43 is located between large profile 41 and workface 20. Small region 43 is constructed to hold a link of chain 16 in place while large profile 41 will allow free engagement therethrough. To connect apparatus 10 to bucket 12, chains 16 are connected from eyelets 28 and through large profile 4 1 of hook 34. Once the desired length of chain is reached between hook 32 and eyelet 28, chain 16 is then positioned from large profile 41 to small profile 43, where it is held securely in place by the weight of apparatus 10. It is also preferable to attach reinforcement guards 45 above and below plates 40 and 42 to make hooks 32 more robust. If guards 45 are not utilized, hooks 34 can be torn from bucket 12 when bucket 12 extends into the earth to collect material. By protecting hooks 34, guards 45 ensure the long term usability and durability of deployment assembly 10.

[0040] Referring now to Figure 6, when a section of landfill is to be covered, the following process is performed. First, the operator takes prime loader 14 to an area where the bucket 12 may be filled with a ballast material. Ballast material may be of any form preferable to landfill operators, but typically takes the form of clay, soil, sand, gravel, rock, or a combination thereof. Once bucket 12 is filled with ballast material, the loader 14 is then driven to the location of deployment apparatus 10. Once in position, the operator lowers bucket 12 without spilling ballast material to

attach apparatus 10. With bucket 12 lowered, the chains 16 of apparatus 10 are attached to hooks 34 on bucket 12. Preferably, one chain is used to secure each end of apparatus 10 to opposing sides of bucket 12. It should be appreciated that alternative methods of attachment may be used as long as the method is simple and not labor intensive. With apparatus 10 securely attached and positioned underneath, bucket 12 of loader 14 can be raised until apparatus 10 is lifted off of landfill surface. The distance that apparatus 10 hangs from bucket 12 of loader 14 is at the discretion of the operator. One benefit of apparatus 10 is that the attachment chains 16 allow the operator to position apparatus 10 with respect to bucket 12 in such a way as to maximize his or her visibility of the film and ballast as it is laid. Once apparatus 10 is lifted, film 18 may be pulled off roll 32 and preferably tucked into the ballast 48 in bucket 12 as shown in Figure 6. Alternatively, clips or pins (not shown) may be used to temporarily attach the film 18 to the bucket 12 prior to deployment. Loader 14 and deployment apparatus 10 are now ready to deploy film 18 to landfill surface 20.

[0041] Referring now to Figure 7, loader 14 with attached deployment apparatus 10 is positioned over an area to be covered. With apparatus 10, the height of the spool of film 18 can be maintained near surface 20 while the bucket 12 is raised high enough for the loader 14 operator to see between bucket 12 and film 18, thus allowing the operator to deploy the film at a higher speed with increased visibility. Further, it is preferable to keep apparatus 10 as low as possible to combat the forces of wind. Loader 14 is positioned to move in reverse over the work area. To start laying a panel of film 18, the controls to bucket 12 are operated to allow a small amount of ballast 48 to fall from bucket 12, releasing tucked film 18 with it. With film 18 upon work surface 20 of the landfill, controls may again be manipulated to drop more ballast 48 upon deposited film 18. With film 18 held in place securely by the weight of the dropped ballast 48, the prime loader 14 is

carefully backed over the area to be covered, deploying film 18 as loader 14 progresses rearward. Because of the relatively small weight of apparatus 10 with respect to loader 14, the degree of incline of surface 20 is not as important as with systems described in the prior art. In contrast to those systems, mover 14 carrying apparatus 10 is capable of laying film while backing up inclines as well as while backing down them. Periodically, at intervals to be determined by landfill operation preferences and regulations, the controls are manipulated to cause bucket 12 to deposit more ballast 48 upon film 18. When at the end of a pass over the landfill ballast 48 is deposited on the end of the film panel and the panel is cut manually by the operator or an assistant. Alternatively, an automated film cutting device (not shown) may be employed to cut film 18 at the end of each laid panel. Once film 18 is cut, the film can be tucked into the ballast, and the loader 14 is repositioned to lay an adjacent panel along a similar path. It is preferred that adjacent panels be laid with 6-24 inches of overlap to more effectively "seal" the fill from the environment. Adjacent panels are laid on top of the workface 20 of the landfill until the desired area is properly covered.

[0042] Furthermore, it has been shown that the deployment of overlapping adjacent panels of film 18 can be enhanced by the adjustment of the angle that is formed between the axis of mandrel 26 and bucket 12. As described above in reference to Figures 1 and 2, this "skew angle" can be adjusted by manipulating the relative lengths of chains 16 at each end of mandrel 26. Additionally, the skew angle may further be manipulated by adjusting the distance between flanges 22,24 to change the effective length of mandrel 26. With apparatus 10 positioned at the desired skew angle with respect to bucket 12, film 18 can be "slung" into their desired overlapping configurations faster and easier than is possible with a mandrel 26 that is positioned substantially parallel to workface 20.

[0043] Referring now to Figure 8, a sprayer apparatus 100 to apply a fluid (liquid or gaseous) is shown attached to loader 14. Sprayer apparatus 100 includes a pressure tank 102 and a pressure cap 104. Attached to pressure tank 102 is a pressure relief valve 106 and a charging pump 108. A shut off valve 110 is connected to the bottom of tank 102 and controls the flow of liquid solution from the tank 102 to a hose 112. Attached at the end of hose 112 is a spray manifold or bar 113 with at least one spray head 114 to create a spray pattern 116 when liquid flows therethrough under pressure. Spray bar 113 preferably extends across the width of the loader 14 with distributed spray head 114 placement to more effectively cover the workface. It should be appreciated an single spray head with a wide path of coverage may communicate directly with hose 112, thus eliminating the need for a manifold device.

[0044] To operate sprayer apparatus 100, pressure cap 104 is unscrewed and the liquid to be sprayed is poured into tank 102. With the liquid in tank 102, pressure cap 104 is replaced and charging pump 108 is activated until the pressure within tank 102 reaches a predetermined level. Charging pump 108 may be of a manual or powered type and may or may not include a pressure indication device (not shown) to indicate when the pressure contained within tank 102 is sufficient. With sufficient pressure in tank 102, shut off valve 110 may be manipulated to allow the pressurized liquid to flow through hose 112 and head 114 to spray liquid 116 upon workface 20.

[0045] Sprayer 100 is preferably located and operated in a position that applies fluid to workface 20 following loader 14, but before the deployment of film 18 and ballast 48. It is preferred that sprayer 100 contain and apply a pesticide solution to the topside workface 20 in order to control the spread of flies, mosquitoes, or any other annoying insect pest, but is understood that any beneficial chemical may be applied using sprayer 100. Examples of other beneficial chemicals that

can be applied using sprayer 100 are deodorants, degradation inhibitors, or degredation accelerators.

[0046] In conclusion, apparatus 10 of the present invention has many advantages over the prior art. A primary advantage is reduced cost. Prior art equipment is expensive and complex, requiring systems of hydraulics, motors, and other machinery. Additionally, reliability of prior art systems is questionable when used in extreme environmental conditions. Apparatus 10 of the present invention costs a fraction of those of the prior art and operates reliably in all weather conditions. In addition to a low cost of ownership, apparatus 10 offers landfill operators reduced heavy equipment costs. Prior art systems require heavy prime movers that are capable of carrying deployment units that weigh several tons. In contrast, apparatus 10 only weighs a few hundred pounds and can be carried by smaller and less expensive machines. Almost all landfill loaders will be capable of carrying apparatus 10. Furthermore, a device in accordance with the present invention may even be attached to the rear of a dump truck to deploy film in a manner consistent with that described above.

[0047] Another primary advantage of the present invention is reduced complexity and maintenance cost. Using apparatus 10, ballast material can be of any size or shape available to the operator since a motorized material movement system or auger is not used. Prior art systems required that ballast material be filtered through a screening mechanism to ensure that the ballast does not clog the various augers or chutes. In contrast, apparatus 10 does not require any such limitations since the bucket container of the loader being used to carry the apparatus is used and no material deposit equipment other than the tilting operation of the bucket container is needed. Any material that can be loaded into the bucket container can be deposited atop the deployed covering. Furthermore, prior art systems require a frame to support the ballast container and delivery system.

Because apparatus 10 does not require such structural heft, it can be easily attached and removed to the loader vehicle, enabling quick changes of film rolls and maintaining the effectiveness of landfill equipment. Vehicles carrying devices of the prior art would be unable to perform their prescribed duties while covering operations are underway and would require time consuming reconfiguration operations to add or remove prior art film deployers. Movers carrying apparatus 10 can often be used for their designed purposes while apparatus 10 is still attached. If not, apparatus 10 can be removed from the vehicle in a matter of seconds. Finally, if the ballast in the bucket of a mover carrying apparatus 10 is depleted, the operator can release apparatus 10, refill the bucket with ballast, reattach apparatus 10 and continue laying film without having to make a cut in the panel of film.

[0048] Another benefit of apparatus 10 of the present invention is the flexibility in the sizes and types of films and or materials it can deploy. Using apparatus 10, any width or thickness of film is capable of being deployed. Because systems of the prior art are framed with rigid members, the width of a panel of film laid by those systems is limited to the maximum amount of space between those members. Apparatus 10 has no such limitation, enabling film panels to be as wide or narrow as the operator desires. Furthermore, because of the simple design of apparatus 10, any material that can be spooled up onto a roll can be deployed to the landfill surface. Such materials can include plastic films, elastomeric sheets, and textiles.

[0049] Numerous variations and modifications will become apparent to those skilled in the art once the above disclosure is fully appreciated. It is intended that the following claims be interpreted to embrace all such variations and modifications.